



## Solutions to Preserve and Promote Traditional Knowledge in Adapting to Floods of Farmers in An Giang Province, Mekong Delta, Vietnam

Pham Xuan Phu<sup>1\*</sup> and Ngo Thuy Bao Tran<sup>2</sup>

<sup>1</sup>An Giang University, Long Xuyen City, An Giang, Vietnam

<sup>2</sup>An Giang University, Long Xuyen City, An Giang province, Vietnam

\*Corresponding Author: Pham Xuan Phu, An Giang University, Long Xuyen City, An Giang, Vietnam.

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### Abstract

This research was carried out to assess the appropriateness of farmer's indigenous knowledge and their adaptive capacity with floods. The research aimed at providing scientific foundation for proposing solutions to conserve and enhance the effectiveness of valuable indigenous knowledge in reducing vulnerability of people living in flooded areas. The results showed that local people are using several effective indigenous knowledges for coping with floods. However, the valuable indigenous knowledge has not recorded yet, nor documented in written materials for sharing to young generation and communities. Besides, some indigenous practices are not suitable in practice which required reevaluation for current flood adaptation strategies. The research suggested some solutions to conserve the most valuable indigenous knowledge for pro-active adaptation of local people in changing climate.

**Keywords:** Climate Change, Indigenous Knowledge, Flood, Adaptation

### Introduction

An Giang is a province in the Mekong downstream area influenced by annual flood. Flood brings large amounts of silt to build up and improve soil fertility; field sanitation, washing alum [3] creating jobs and income for people in the flooding season such as fishing, vegetables and travel services. Besides, the floods also cause damage to agriculture, livelihoods of people in floodplains; specifically, the flood lasts from October to November by Mekong water combined with heavy rain water causing flood in most of the districts in the province and urban areas during big floods. Low areas covered in water from 1.5 m to 4.5 m causing huge damage to property and people's lives [11-14]. There had many systematical research and evaluation relevance system to indigenous knowledge to adapt to flooding changes in agricultural production in the study area in the scene of climate change, preserve medicinal plants, preserve genes, local varieties, live with floods in the Mekong Delta, change the weather of author [1,2,4-11,15]. However, the fact that there has not had many systematical research indigenous knowledge assessment and Solutions to preserve and promote traditional knowledge in adapting to floods in study sites in context climate change. For these reasons, it is necessary to car-

ry out the study on "Solutions to preserve and promote traditional knowledge in adapting to floods of farmers in An Giang province, Mekong Delta, Viet Nam".

### Research objectives

The research will focus on the specific objectives below:

- To Analyze and evaluate the status of traditional knowledge of farmers to adapt to floods in different conditions.
- To propose conservative measures and promote the value of using indigenous knowledge of farmers in An Giang province.

### Research questions

The research is focusing to answer the following questions:

- What is farmer's indigenous knowledge in applying to floods of different zone ?
- What are proposing solutions to conserve and enhance the use of indigenous knowledge in reducing the vulnerability of people living in flooding areas and livelihood strategies of flood affected people are both effective and sustainable?

## Research methods

To achieve objectives provided, the study was analyzed and evaluate the status of traditional knowledge of farmers to adapt to floods in different conditions from different information sources. Field survey was conducted from July 2015 to March 2016 at upper zone (Phu Huu, Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes), An Phu, Chau Thanh, Tri Ton district, An Giang province.

The following methods have been done:

- Literature review: To refer the previous researches and reports which related to climate change, the status of drought and its impact, especially in the Mekong delta.

Both the quantitative and qualitative methods were used for survey. The research was done following these methods: in - depth interview (for both local authorities and local people), focus group discussions and questionnaires.

### In - depth interview

The team has conducted in depth interviews those people who are representative of local authorities at the three levels (province, district and commune). By interviewing, the general information about the how local people know about flood and their actions to cope with it will be understood. In addition, the demand of local people may be found out in this step. Also, individual people who showed appreciable knowledge of environment change were selected for in- depth interviews. The interviews focus on the story of using their own knowledge to adapt well with the effect flood. The in - depth interviews were conducted by using semi-structured questionnaires. Information were written down and recovered by voice recorder.

### PRA (Participatory Rural Appraisal)

The meeting was done, the participants for the meeting were 15 people. It was done in the upper zone (Phu Huu, Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes), An Phu, Chau Thanh, Tri Ton district, An Giang province. Therefore, these households have enough time to experience and accumulate local living experiences while gaining indigenous knowledge that has been applied to life experiences and to get a general understanding about the life of local people, their assets and also to know how they have faced with the flood in context of climate change. The criteria to people that they are farmers, who are experienced households living with floods and more than 50 years of living of study sites. These five

tools were used: time line, mapping, seasonal calendar, problem tree, Venn diagram, ranking. The participants are people doing in agricultural production in the community.

### Questionnaires

Questionnaires is used to find out the damages of flood on the livelihood of local people, questionnaires mainly to identify current observed flood and its effects of such changes particularly on local livelihoods; the resources available to them, and the extents the traditional knowledge to help the people live and cope with the effects of flood. Interview local experienced households living with floods and more than 50 years of living of study sites such as: the upper zone (Phu Huu, Phuoc Hung communes), middle zone (Vinh An, An Hoa communes) and lower (Vinh Phuoc, Luong An Tra communes). Therefore, these households have enough time to experience and accumulate local living experiences while gaining indigenous knowledge that has been applied to life experiences. Totally, 360 questionnaires were done, the interviewees are divided into two groups: (i) people living in high dyke (180 households); (ii) people living in no dyke (180 households).

## Results and Discussion

### The situation of using indigenous knowledge of the local people in flood forecasting in study sites

Experiences have been used by people to forecast floods including observations of flood events in previous years; water color, wind direction; observing the expression of some species of plants, animals, insects. The results show that there is a difference in the proportion of people using these signs as a basis for flood forecasting in the three study areas. In upper zone, the percentage of people using these signs for flood prediction is higher than for the other two areas, the lowest is middle zone. In the signs to observe flood forecasts, observe water colors, plants and animals most used by the local people and at least local people used method is water measure. Flood monitoring methods (cycle or time) and water measure for flood forecasting are used in upper zone.

For flood cycles or flood periods, local people rely on the following characteristics (i) In May and July of the Lunar year, the water rises quickly; In July and August, flood starts; (ii) Every 3 year with small flood, 1 big flood will take place or every ten years with high flood (iii) Big flood takes place during Year of Dragon.

Based on water color observations, more algae in water (water ovum) or water ovum appears early (In May, June of lunar year).

Predict floods water color by to know the flood next year large or smaller than the current year such as On December 30 of lunar year, people weigh a bottle of river water; On January 1, people get a different river water bottle at the same position then weigh two bottles, big flood are about to take place if the later bottle is heavier.

In the south wind, if the wind blows with rain, the water will rise quickly and flow strongly, then the flood will be high, vice versa if the wind blows back, then the flood.

Observing the behavior of animals such as ants, termites, nesting birds on tall trees; hammock on high; chicks, storks follow the herd; spider web is more in July lunar month, there will be heavy rain.

Observation of vegetation is based on (i) Reed shoots have 4-5 segments during Lunar May (2 segments indicate small flood); (ii) Reed leaf tip has more than 2 segments (1 segments indicate small-flood); (iii) Reed has 50 cm long segments.; (iv) Grass leaf grows near the tip or grows multiple segments. (v) Young bamboo shoot grows higher than older ones; (vi) *Elaeocarpus hygrophilus* roots grows more than usual.

However, household interview results showed that most of the people in different zone (upper zone, middle zone, lower zone) can not predict floods, of which the highest proportion of people without flood forecast (middle zone) is 89.4%, next to middle zone (86,7%) and upper zone (76,7%). The number of people predicted flood in all of different zone is very low. In addition, people also believe that the signal to forecast the flood has changed but not much. Signs of flood forecasting such as cyclical and flood time observations, water color observations, vegetation and water measure are no longer accurate. Therefore, in order to forecast floods, people need to combine more information together.

Local people also said that in recent years, due to the unusual weather and complicated weather, the accuracy of flood forecasting and weather is not as high as before. Particularly in 2011, bamboo shoots are not taller than bamboo shoots, but the water level is still high, or in 2015 there are many water eggs but no floods (PRA, 2016).

### **The situation of using indigenous knowledge of the local people to adapt to floods in study sites**

By living with the floods every year, local people have accumulated many experiences to forecast and adapt to floods in order to protect lives and property of people in life and in agricultural production. By living experience with the floods from the previous

floods, the people actively prevented and reduced flood damage. First of all, local people in the flood area know how to build a house on stilts with lifts; When there are signs of rising water, people actively raise the floor

For agricultural production, people actively change the seasonal calendar, cultivating, fertilizing, tillage and harvesting techniques. Local people also know how to protect their livestock during the flood season by banana rafts, straw and mud on the raft, cattle and poultry on the raft. Organic fertilizer for plants. In catching aquatic species in all three study areas based on water level, observe fish caught to predict fish species will be present in the next day.

Facing abnormal floods, people in three study areas have changed the way floods are forecasted. Unlike in the past, when floods were forecasted, people often paid attention to the natural signs of prediction, but now they know how to combine indigenous knowledge with flood forecasting and the evolution of floods. The media to find the appropriate response. This approach was chosen by most people in all three regions (93,3%).

Setting up a mobile kindergarten (floating house) means concentrating the children in a place to avoid floods of adults replacing children sitting to help keep parents safe during the flood season. However, in the three study areas only the upper zone established the mobile kindergarten, the remaining two did not at middle zone and lower zone. The cause may be that in the upper zone, floods are always flooded more deeply than the other middle zone and lower zone, local people in this area often use the flood season to exploit natural resources, in addition due to the ability to flood often. The most common cause of death in children is higher than in the other two regions. Therefore, this mobile kindergarten helps to reduce the loss of children's lives during the flood season.

Living house on stilts, this is a method of adaptation to floods that have been used by local people in floods for a long time. In the past, local people in the flood area have known to build houses in the style of stilts on the lift. When there are signs of rising water, local people actively raise the floor. However, for this adaptation method, there was a difference in the proportion of people using the three study areas, with 93,3% of the surveyed households in the upper zone, while in the middle zone and lower zone only 80% of households use this measure.

The results also showed that in the high flood area, the majority of local people in the house on stilts have the height of 1,6-2,9m, accounting for 53,3% and the floor on 3m is 6,7% higher. The remaining two areas are in lower zone and middle zone flood areas.

In contrast, people in the middle zone and lower zone flood areas have houses on stilts of 1,2-1.5 m, accounting for 46,7% and 33.3% higher than flood. This showed that local people in high flood areas have high water levels, so they have higher house on stilt with lower floodplains and floods. In each region, local people did not tend to change the height of the floor in the future accounts for 50% because people think they have taken the landmark of the two major floods to rebuild the house in 2000, 2011. Beside 35,6% of people in the study area wanted to raise the trend of raising houses more because local people think that the weather is very complicated, so in the following years the floods may be high in 2000 and in 2011 and very few people have the opposite trend.

**The situation of using indigenous knowledge of the local people to adapt to floods in agricultural production**

Based on the results of the survey, in agricultural production, local people in three research areas still obtain a lot of experience to adapt such as crop calendar change, seed cultivation, fertilization, tillage and harvest accordingly.

In addition, research results show that people need to access information from the media quickly to adapt to floods in agricultural production in climate change because current information usually they give very delay so they are unlikely to adapt. In addition, the average level of education of the households is low, mainly illiterate or primary education and secondary education, which in part has affected the adoption of science and technology in production to adapt to climate change. On the other hand, the majority of farmers in general and cultivation of rice in particular often follow the experience not recommended by the scientists, so the farmers do not have the attitude should certainly not follow advice and guidance of the professional.

**Assessing of stability for using farmer’s traditional knowledge and adaptive capacity to floods in agriculture production**

**Assessing of stability for farmer’s indigenous knowledge in flood forecasting study sites**

The results showed that people predicted floods by priority rank one is wind direction, second comes based on animals, third is based on cycle and flood time, fourth is water color, fifth is vegetation (Table 1). Local people priority based on wind direction and animals still follow the laws of nature should remain consistent and accurate should preserve and promote this knowledge. Based on the cycle and time of flood, water colors are not as accurate and consistent as before due to human impact.

| IK | 1 | 2 | 3 | 4 | 5 | 6 | score | Ranking |
|----|---|---|---|---|---|---|-------|---------|
| 1  |   | 1 | 3 | 1 | 3 | 1 | 3     | II      |
| 2  |   |   | 3 | 4 | 5 | 6 | 0     | V       |
| 3  |   |   |   | 3 | 3 | 3 | 6     | I       |
| 4  |   |   |   |   | 5 | 4 | 2     | III     |
| 5  |   |   |   |   |   | 5 | 3     | II      |
| 6  |   |   |   |   |   |   | 1     | IV      |

**Table 1:** Farmer’s indigenous knowledge in flood forecasting study sites

**Note:** (1): Animal behavior observation, (2) Plant observation, (3): Sky and clouds observation, (4) Moon and star observation, (5) Clouds covered the mountainside, (6) Rainbow; IK: Indigenous knowledge

**Assessing of stability for farmer’s indigenous knowledge in weather forecasting in study sites**

Results Table 2 shows that people forecasting floods by priority rank 1 is downwind, second comes based on animal behavior observation, third is Flood cycle and flood period, fourth water color, sixth is a plant observation. Priority based on downwind and Animal behavior observation still follow the laws of nature should remain consistent and accurate should preserve and promote this knowledge. Based on the Flood cycle and flood period, water colors are not as accurate and consistent as before due to human impact.

| IK | 1 | 2 | 3 | 4 | 5 | Score | Ranking |
|----|---|---|---|---|---|-------|---------|
| 1  |   | 1 | 1 | 4 | 1 | 3     | II      |
| 2  |   |   | 3 | 4 | 5 | 0     | V       |
| 3  |   |   |   | 4 | 3 | 2     | III     |
| 4  |   |   |   |   | 4 | 4     | I       |
| 5  |   |   |   |   |   | 1     | IV      |

**Table 2:** Farmer’s indigenous knowledge in weather forecasting in study sites.

**Note:** Animal behavior observation, (2) Plant observation, (3): Flood cycle and flood period, (4) downwind, (5) Water color

**Assessing of stability for farmer’s indigenous knowledge in agriculture production and life activities in study sites**

Results Table 3 shows that indigenous knowledge of people in agricultural production and life is still accurate and appropriate to preserve and promote this knowledge to local communities. Based on the results of the analysis, farmers in the flood-prone areas have

a lot of indigenous knowledge that still holds much valuable indigenous knowledge in adaptation to the agro-products used in agriculture and life.

| IK | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Score | Ranking |
|----|---|---|---|---|---|---|---|---|---|-------|---------|
| 1  |   | 1 | 3 | 1 | 5 | 6 | 1 | 8 | 9 | 3     | V       |
| 2  |   |   | 3 | 2 | 5 | 2 | 2 | 8 | 9 | 3     | V       |
| 3  |   |   |   | 3 | 3 | 3 | 3 | 3 | 9 | 7     | II      |
| 4  |   |   |   |   | 5 | 4 | 4 | 8 | 9 | 2     | VI      |
| 5  |   |   |   |   |   | 5 | 5 | 8 | 9 | 5     | IV      |
| 6  |   |   |   |   |   |   | 7 | 8 | 9 | 1     | VII     |
| 7  |   |   |   |   |   |   |   | 8 | 9 | 1     | VII     |
| 8  |   |   |   |   |   |   |   |   | 9 | 6     | III     |
| 9  |   |   |   |   |   |   |   |   |   | 8     | I       |

**Table 3:** Farmer’s indigenous knowledge in agriculture production and life activities

**Note:** (1): Good soil and bad soil,(2)seed preservation (3): Plant maintenance, (4) the process of a *seed* starting to grow, (5) Fertilizing, (6) Raising cattle and poultry, (7) Set of scrub to attract more fish, (8) House on stilts,(9) Cure common diseases

In short, the study compiled 39 indigenous knowledge and adaptability to floods and weather forecasts in agricultural production and livelihoods of local people in the study area. In which, there are 31/39 indigenous knowledge still valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. In addition, there are 8/39 indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

**The solutions to preserve and traditional knowledge of people in the local communities**

**The local government**

- People need to raise awareness of community based on flood adaptation using indigenous knowledge for departments and agencies operating in relevant fields in agricultural production.

- Integrating ideas and initiatives to use indigenous knowledge in local social - economic development programs such as flood-adapted livelihood models using indigenous knowledge in sustainable development strong.
- People needs to invested in systematic scientific research on indigenous knowledge, flood adaptation, mitigate climate change impacts in accordance with local conditions. Encourage the choice of using indigenous varieties and seedlings for stable productivity and high and stable market demand, suitable to the land conditions, cultivation level of the people, adapting to floods in the conditions of climate change.
- Encourage the use of indigenous variety and techniques in parallel with the application of modern science and technology to create sustainable development of the community and conservation of genetic resources and techniques for scientific research modern learning.
- Need to research and build more models of living with floods using indigenous knowledge, replicating the models effectively to confirm the role and importance of indigenous knowledge in the community.
- Enhance communication to disseminate indigenous knowledge to flood-coping communities in combination with scientific and technological advances to create new knowledge to help farmers adapt to changes in the environment. Strengthen communication and dissemination of knowledge in order to prepare changes of abnormal floods in the flood season. Open training courses to respond to floods for people in flooded areas. Encourage the establishment of teams with experience in indigenous knowledge to share, help unload in the production adapt to floods in the changing climate conditions using indigenous knowledge. Facilitate the exchange and sharing of experiences among people in the same locality and with other localities to limit the lowest possible risks of flood impacts in the context of climate change.
- There should be policies to protect intellectual property rights on indigenous knowledge in the flood area: The nature of indigenous knowledge is to exist in the form of information transmitted through systems, or exchange between individuals, the community should have many indigenous knowledge still valuable in the risk of being eroded over time, or illegally exploited outside the control of the individual or local community holding the ant This native consciousness. Indigenous knowledge is a common property of a community or a specific

locality, so it is not owned by any individual or organization if it is commercialized which will cause negative effects on customs and beliefs, culture of the whole community. Therefore, it is necessary to have a policy of protection rights to own indigenous knowledge of individuals, communities or localities that hold valuable indigenous knowledge to preserve and promote indigenous knowledge in the locality.

- It is necessary to have policies to preserve natural medicinal plants in the locality: Most people choose to use Western medicine in treating diseases, even mild diseases, usually. Only a few people still use drugs derived from natural plants and grass, such as Nam medicine, North medicine, and even fewer people who grow their own medicinal plants or use natural medicinal plants. Disseminate knowledge about natural herbs to people, open clubs about medicinal plants for people to participate as well as preserve local resources. Provide information on how to prevent and treat common diseases for people.
- It is necessary to have policies to encourage the preservation and preservation of indigenous knowledge and flood management in the locality: For local authorities, when the development plan should not implement the plan from the top down, ignore the role of local people and their indigenous knowledge. Planning must be based on valuable indigenous knowledge, helping them use the indigenous knowledge to solve and deal with challenges. In the local economic development strategy by integrating valuable indigenous knowledge in long-term adaptation to climate change into local socio-economic development strategies and plans. It is necessary to have policies to study, preserve, store and use indigenous knowledge in flood community and consider it as an adaptation measure for people in flooded areas in An Giang province in particular and in the Mekong Delta provinces in general.

#### For local people

- Raising awareness of the community on the value of indigenous knowledge: Through recording and sharing indigenous knowledge through stories in lyrics, drawings, storytelling, plays, books, videos, movies, seminars and other forms of traditional communication or dissemination across the mass media to be handed down to the next generation.
- The members of the community help to self-record the methods of indigenous knowledge to adapt to floods: Through the transmission of the results of recording indigenous knowledge through newspapers, books, videos and pictures traditional communication methods or mass media such as radio

and television. Encourage indigenous methods of keeping and recording to pass on to the next generation.

- The widely implement valuable indigenous knowledge and apply in agricultural production and flood-adapted life: Through encouraging local people to preserve their own knowledge such as establishing seed banks, crops and livestock managed by farmers themselves.

#### Conclusion

Indigenous knowledge plays an important role in adapting to changes in the environment. As a national resource, it also contributes to the sustainable development of the local community in inexpensive ways, including the participation of people and achieving sustainable development.

Indigenous knowledge of local people is based on the specific characteristics of the organisms and changes in environmental conditions such as warning signals for local people to forecast floods and weather to prepare for appropriate change in production and life.

The study compiled 39 indigenous knowledge and adaptability to floods and weather forecasts in agricultural production and livelihoods of local people in the study area. In which, there are 31/39 indigenous knowledge still valuable in predicting and adapting to floods. However, this knowledge has not been specifically recorded and stored appropriately for transmission to the latter and widely shared in the community. In addition, there are 8/39 indigenous knowledge that is no longer relevant and misleading compared to the present. It should be considered in the current context due to human impacts and climate change. Therefore, the possibility of flood forecast of the people also decreased, only a small number of people can predict the flood, the weather. It is necessary to increase knowledge and encourage people to combine indigenous knowledge and scientific knowledge to minimize the damage caused by floods.

#### Suggestion

- There should be policies to protect intellectual property rights on indigenous knowledge in the flood area in local community.
- Further research on of indigenous knowledge in the field is needed for customs, culture, breeds, crops and livestock for different ethnic groups such as Cham, Hoa, Kinh and Khmer in different flood and coastal areas in the Mekong Delta.

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